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Coronary Artery Bypass Graft Patients' Pain Perception During Epicardial Pacing Wire Removal

by

Sylvia Roschkov

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Nursing

Faculty of Nursing

Edmonton, Alberta

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Abstract

Surgical placement of temporary epicaridial pacing wires (EPWs) onto the epicaridial surface of the heart is standard practice during cardiac surgery. The purpose of this study was to determine the quality and intensity of pain and sensations experienced during the procedure of EPWs removal for coronary artery bypass (CABG) patients. A descriptive study incorporating the McGill Pain Questionnaire-short form (MPQ-SF) and visual analogue scales were used with 100 CABG patients requiring EPWs removal. The pain intensity reported was mild (47%), while the main sensation experienced was pulling (70%). Age, gender, previous cardiac surgery and EPWs removal experience, and use of analgesics did not influence the pain and sensations experienced. However, patients that had EPWs removed on postoperative day 5 or less reported significantly higher MPQ-SF affective and combined scores. CABG patients can be prepared for EPWs removal by providing information that the procedure is a mildly painful, pulling sensation.

Dedication

I would like to dedicate this work to my husband, Tom who has stood by me every step of the way. You inspire me everyday to be the best person that I can be. To my children, Quin and Bailey, I laugh and learn from you both daily. I also dedicate this to my parents, Willie and Faye Mah who instilled in me, the love of learning.

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Chapter One

Introduction

Cardiovascular disease (CVD) is the leading cause of death in the United States, accounting for approximately 500,000 deaths per year. It is the leading cause of death in men and in women more than 50 years of age (American Heart Association, 1999). In Canada, CVD accounts for one-third of all Canadian deaths annually. As the population ages, the incidence of CVD will increase (Heart and Stroke Foundation of Canada, 1999). Advances in pharmacotherapeutics, technology, and physician expertise have improved the opportunities for revascularization of the myocardium. Coronary artery bypass graft (CABG) surgery remains a common method of revascularization, with over 18,000 cases performed across Canada in 1996 (Heart and Stroke Foundation of Canada, 1999). At the University of Alberta Hospital, 792 patients underwent CABG surgery in 2001, which is approximately 100 cases more than the previous year.

During cardiac surgery, surgical insertion of temporary epicardial pacing wires (EPWs) is standard practice. EPWs can be used postoperatively to assess and diagnose cardiac dysrhythmias, and institute temporary pacing to treat certain dysrhythmias (Johnson, Brown, & Alligood, 1993; Lynn-McHale, Riggs, & Thurman, 1991; Manion, 1993; Schultz & Woodall, 1989; Wollan, 1995). Postoperative dysrhythmias that may require the use of the EPWs primarily occur within the first three postoperative days (Johnson et al., 1993; Schultz & Woodall, 1989; Vitello-Cicciu et al., 1987). Therefore, the routine removal of EPWs is generally performed on the 4th or 5th postoperative day, dependent upon cardiac rhythm and anticoagulant status (Eldibs, Krajcer, Lufschanowski,

Coley & Leachman, 1980; Lynn-McHale et al., 1991; Manion, 1993; Schultz & Woodall, 1989).

Historically, the removal of EPWs has been a procedure performed by the cardiac surgeon due to the potential risks associated with EPW removal (Manion, 1993). Potential complications cited in the literature include cardiac tamponade, dysrhythmias, migration of EPWs fragments, infection, and bleeding at the exit site of the EPWs (Johnson et al., 1993; Wollan, 1995). However, complications are rare, with a reported risk of 0.4% in the adult cardiac surgical population (Del Nido & Goldman, 1989). Cardiac surgical programs subsequently have developed policies that enable nurses to remove EPWs (Carroll et al., 1998; Wollan, 1995). Not only have nurses performed the procedure in a competent manner, but by doing so, facilitate patient discharge and cost effectiveness (Wollan, 1995).

Nursing practice not only encompasses procedural competency, but also ensures that patients are educated and prepared for procedures. It had been reported that patients prepared for procedures are more likely to have favorable outcomes (Gift, Spearing Bolgiano, & Cunningham, 1991). However, little is known about patients' experiences during EPWs removal. Specifically, procedural pain and sensations during EPWs removal has not been well studied. Only one study (Carroll et al., 1998) was located to date, which suggested that patients did perceive pain during EPWs removal. However, no descriptors were identified to describe the pain or sensations during the procedure. It is important that nurses be able to assist patients by being able to provide information as to the type of sensation and pain that may be experienced during this procedure.

Purpose of the Study

The purpose of this study was to determine the quality and intensity of pain and other sensations experienced during the procedure of EPWs removal. Also, the anxiety level experienced during this procedure was documented as well as other factors relevant to the pain experience such as age, gender, postoperative day, previous cardiac surgery, and length of time since last analgesic. The specific research questions that were investigated included the following:

1. What are CABG patients' perceptions of the quality and intensity of pain experienced during EPWs removal?
2. What are the CABG patients' reported quality and intensity of sensations experienced during EPWs removal?
3. What are the factors that influence CABG patients' pain and sensations experienced during EPWs removal?

Significance of Study

The cardiac nurse is expected to assist the cardiac patient in progressing through the acute postoperative recovery phase. As more nurses are expected to remove EPWs following CABG surgery, it is important for the nurse to be able to inform the cardiac patient of the possible pain or sensations that may be experienced during EPWs removal. Having this knowledge will enable the nurse to prepare the patient adequately and offer support and reassurance.

Presently, there exists only one study that examined patients' pain intensity during EPWs removal following CABG surgery, yet the placement of EPWs is commonplace. By better understanding the dimensions of this pain, we can gain insight to the

experiences of CABG patients during EPWs removal. As the general population ages and the incidence of CVD increases, the number of CABG surgeries will only increase with its associated EPWs placement. Research that identifies and explores factors related to the pain and sensations experienced during EPWs removal would enable nurses to provide support to CABG patients during this procedure.

Chapter Two

Literature Review

A literature review was completed for studies describing epicardial pacing wire (EPWs) use and removal, complications reported from EPWs removal, patient procedural preparation, and patient procedural experiences by searching MEDLINE and CINAHL databases from 1970 to present. Also, Internet sites were searched such as the American Heart Association and the Canadian Heart and Stroke Foundation.

Epicardial Pacing Wires

Epicardial pacing wires have been used in cardiac surgery since their introduction in the 1960's. Today the placement of these wires is commonplace in the postoperative management of cardiac surgical patients. During cardiac surgical procedures such as a coronary artery bypass graft (CABG), EPWs are routinely inserted to assess and diagnose cardiac dysrhythmias and institute pacing as necessary.

The wires consist of thin Teflon insulated stainless steel with each end being uninsulated. The distal uninsulated end of the EPWs are attached to the epicardial surface of the heart, while the proximal uninsulated end is tunneled through the chest wall and secured with a stitch to the skin surface. The number of wires placed and the site of wire placement are dependent upon the surgeon's preference. Usually, one or two EPWs are secured onto the right atrial epicardium and are then tunneled through the chest to exit right of the sternum. In addition, one or two more EPWs are secured to the right ventricular epicardium and tunnel through to exit left of the sternum. If the EPWs are not in use, they are secured to the skin with tape (Baas & Schneider, 1986; Harjula, Jarvinen,

Mattila, & Hartel, 1985; Johnson et al., 1993; Lynn-McHale et al., 1991; Manion, 1993; Schultz & Woodall, 1989; Vitello-Cicciu et al., 1987; Wollan, 1995).

Use of Epicardial Pacing Wires

Cardiac dysrhythmias are not uncommon in the first three postoperative days. The incidence of dysrhythmias can range from 48% to 74% (Lynn-McHale et al., 1991). Generally, patients that have had valvular surgery have a higher incidence of dysrhythmias than CABG patients (Lynn-McHale et al., 1991; Schultz& Woodall, 1989). Dysrhythmias can be potentially dangerous and may compromise postoperative recovery. EPWs are useful in assisting with diagnosis and treatment of certain dysrhythmias. Assessment of dysrhythmias can be achieved by means of an atrial electrogram (AEG) performed with the use of the atrial EPWs (Bass & Schneider, 1986). An AEG is a tracing of the electrical activity obtained directly from the epicardial surface of the heart. The atrial activity is heightened since the recording is obtained directly over the chamber undergoing electrical depolarization. Therefore, the AEG can be advantageous in the diagnosis of dysrhythmias that originate in the atrium. Also, the AEG can be beneficial in identifying the relationship of atrial to ventricular activity if not distinguishable on a surface electrocardiogram (Bass & Schneider, 1986; Schultz & Woodall, 1989).

Treatment of dysrhythmias can occur with temporary pacing, either by suppressing the dysrhythmia or by improving hemodynamic function (Lynn-McHale et al., 1991; Manion, 1993). In a prospective study conducted by Vitello-Cicciu et al. (1987), a convenience sample of 100 CABG patients with EPWs in place were studied to profile those patients requiring the use of the EPWs postoperatively, and the incidence of EPWs usage. Forty-seven percent of postoperative CABG patients required the use of the

EPWs within the first few days of surgery. The most common indication for use of the EPWs was the need to augment cardiac output ($p< 0.001$). In addition, EPWs were used for dysrhythmia diagnosis in 6% of patients, and in 15% of patients to manage heart block and supraventricular ectopy. Also noted, elderly patients ($p< 0.05$), patients with a recent myocardial infarction ($p< 0.01$), and patients using diuretics preoperatively ($p< 0.01$) had a significantly higher incidence of pacing than patients without these characteristics. No morbidity or mortality was associated with the use of the EPWs.

In an earlier study by Mills and Ochsner (1973), 325 pediatric and adult patients undergoing valvular and CABG surgery with only atrial EPWs in place, were studied to identify EPWs use. Results showed that 16% of patients required the EPWs for dysrhythmia evaluation while 37% of patients required pacing to increase cardiac output. The discrepancies between these findings and those of Vitello-Cicciu et al. (1987), may be attributed to the addition of valvular surgery and pediatric subjects with only atrial wires in this study, whereas Vitello-Cicciu et al. (1987) included only adult CABG patients with both atrial and ventricular EPWs in place.

Temporary pacing has been reported as high as 45% in the early postoperative period following cardiac surgery (Baas & Schneider, 1986). It is proposed that the reason for temporary pacing is the need to increase cardiac output by increasing the heart rate. Cardiac patients may have a suppressed heart rate due to beta blocker medication used preoperatively to treat coronary artery disease while other factors that may affect the conduction system include hypothermia, hypoxia, fluid and electrolyte imbalances, and myocardial ischemia during the operative and immediate postoperative period (Baas & Schneider, 1986). If temporary pacing is required, atrial pacing, ventricular pacing, or

atrioventricular pacing maybe initiated depending on the dysrhythmia that is present and the EPWs that are available for use (Finkelmeier & O'Mara, 1984; Lynn-McHale et al., 1991). Once temporary pacing is no longer required or a permanent pacemaker has been inserted, the epicardial pacing wires are then removed.

Complications from Removal of Epicardial Pacing Wires

Complications from removing EPWs are very rare compared to the number of EPWs that are removed each year (Wollan, 1995). Del Nido and Goldman (1989) reported that in the adult cardiac surgical population the risk of complications from removing EPWs is 0.4%. Potential complications include cardiac tamponade, dysrhythmias secondary to mechanical irritation of the myocardium, migration of EPWs fragment, infection secondary to a retained wire fragment, and bleeding from the exit site of the EPWs (Johnson et al., 1993; Wollan, 1995).

There have been four separate cases reported of cardiac tamponade in the literature. The earliest case of cardiac tamponade reported resulted from a laceration of a small coronary vessel on the ventricular surface of the heart. This occurred when the EPWs were removed on the 7th postoperative day following CABG surgery. The patient felt unwell soon after the EPWs were removed and returned to the operating room to have the vessel repaired (Baldwin & Dorney, 1971). The most recently reported case of tamponade occurred when a CABG patient had his EPWs removed on the 6th postoperative day, which resulted in a laceration of the saphenous vein graft to the posterior descending coronary artery. The patient also needed to return to the operating room for repair of the graft (Gal, Chaet, & Novitzky, 1998). In the two other reported cases in the literature, the saphenous vein graft to the right coronary artery was torn

during the removal of the EPWs, which resulted in pericardial tamponade. The EPWs in both cases had been removed on the 6th and 7th postoperative day following uncomplicated CABG surgery. However, both patients became symptomatic 2 hours after the EPWs were removed (Hoidal, 1986; Price & Keenan, 1989). In all reported cases of cardiac tamponade, symptoms occurred immediately to within 2 hours post EPWs removal. The symptoms included various combinations of hypotension, bradycardia, tachycardia, paradoxical pulse, jugular vein distension, pallor, dyspnea, and anxiety. In an unusual case of postoperative bleeding that lead to cardiac tamponade, the patient began to bleed increasing from his mediastinal chest tubes at 10 hours post CABG surgery (Smith & Tatoulis, 1990). Upon return to the operating room, it was found that the patient had a right atrial tamponade as a result of the distal end of the atrial pacing wire having perforated a segment of the right atrial wall.

Dysryhthmias from EPWs being removed result from mechanical irritation of the myocardium. In two studies in which postoperative cardiac surgery patients were monitored for incidence of cardiac dysrhythmias during EPWs removal, the incidence for couplet premature ventricular complexes (PVCs) and/or multifocal PVCs immediately following EPWs removal was reported as 9% and 20%, respectively (Edlibs et al., 1980; Harjula et al., 1985). The discrepancies in the incidence might be attributed to the small sample size in the Edlibs et al. (1980) study, which only enrolled 22 postoperative cardiac surgery patients. Harjula et al. (1985) enrolled 83 patients of which 95% of these patients had valvular surgery. The number of valvular patients enrolled in the later study may have had some influence on the higher incidence of PVCs.

In a more recent study, a convenience sample of 145 cardiac surgery patients that had undergone various cardiac procedures were studied to identify the frequency of lethal dysrhythmias during EPWs removal (Carroll et al., 1998). Ten patients experienced nonsustained ventricular tachycardia. Nonsustained ventricular tachycardia was defined as 3 or more PVCs in succession. Six of these patients had a 4 beat run of ventricular tachycardia while the other 4 patients had a 3 beat run of ventricular tachycardia. It was noted that of these 10 patients, 5 patients were repeat cardiac surgeries. These 5 patients had significantly more nonsustained ventricular tachycardia ($p < .01$) during EPWs removal than first time cardiac surgery patients (Carroll et al., 1998). However, it was not clearly understood as to why nonsustained ventricular tachycardia was more common in patients who had undergone repeat cardiac surgery. All the patients in this study that experienced PVCs spontaneously converted back to the rhythm that existed prior to EPWs being removed.

Occasionally, EPWs are left in the thoracic cavity following cardiac surgery particularly when strong resistance has been encountered during EPWs removal. Thus, the EPWs are clipped at the skin surface. Also, EPWs may fracture during removal leaving a fragment to float in the thoracic cavity or attached to the epicardium (Johnson et al., 1993). Both of these situations can potentially cause infection and/or migration of the EPWs to occur. Two cases have been reported whereby retained temporary EPWs migrated to other areas of the body. Korompai, Hayward, and Knight (1987) reported a patient who presented to the emergency department with sudden sharp pelvic pain. The pain was investigated and traced to a migrating fragment of the EPWs in the peritoneal cavity. It was noted that the EPWs had been clipped at the skin during the postoperative

cardiac period 6 years previously and that the patient had been well until arriving to the emergency department. Similarly, a 52 year old man who had undergone CABG surgery a year ago and had remained symptom free presented to the emergency department with severe chest pain radiating to his back (Gentry & Hassan, 1993). Upon cardiac workup, the chest radiography showed a mass in the right lung that was identified as the EPWs that had been clipped post-cardiac surgery. In both cases, the patients required surgical intervention to remove the retained EPWs.

Along with retained EPWs, there is potential for infection. Mansur, Grinberg, Costa, Chung, and Pileggi (1984) reported a case of fatal infection secondary to retained EPWs. A 45 year old woman who underwent a prosthetic mitral valve replacement had her EPWs clipped prior to discharge from hospital. Two years after having cardiac surgery the patient developed a staphylococcal abscess around the retained EPWs. Initially the patient responded to antibiotic therapy but was readmitted to hospital 30 days later for refractory heart failure and valvular insufficiency. Despite further cardiac surgery to replace the infected valve, the patient died from unresolving bacteremia. Four other cases of infection associated with retained EPWs have also been reported by Lyons, Chaudhry, and O'hern (1986) and were treated successfully with antibiotic therapy. Because of the risk for potential complications due to removal of EPWs, close monitoring and proper technique for removal of EPWs should be used at all times (Johnson et al., 1993).

Removal of Epicardial Pacing Wires

Routinely, EPWs are removed on the 4th or 5th postoperative day following cardiac surgery. The wires are removed by applying gentle traction in a continuous

motion until release of the distal end of the EPWs is felt in the epicardium. The wires are then pulled completely out through the skin (Johnson et al., 1993; Lynn-McHale et al., 1991; Manion, 1993; Wollan, 1995). Historically, physicians have been responsible for removing the EPWs because of the potential complications that may occur from EPW removal. However, the removal of EPWs is becoming an expanded role for nurses. As this procedure becomes a nursing function, nurses will be expected to prepare patients and provide patient teaching about the procedure of EPWs removal (Wollan, 1995).

Patient Procedural Preparation

Patients that are educated about their disease and/or surgical experiences are less likely to be anxious and are more willing to be compliant with the medical regimes necessary in their care (Fortner, 1998). Sensory information is described as information that is specific to sensory modalities such as sight, taste, smell, touch, and feel (McHugh, Christman, & Johnson, 1982). By providing sensory information, patients will know what to expect from a procedure and not be confronted with unexpected sensations. Preparatory information that accurately describes sensations experienced during threatening procedures reduces the discrepancies between expected and experienced sensations and thus, reduces anxiety (Garvin, Huston, & Baker, 1992; Hartfield, Cason, & Cason, 1982).

The idea around providing persons with preparatory information is based on cognitive theory of emotion. It is thought that a person's cognitive ability can alter the perceived meaning of threatening stimuli and therefore reduce a person's anxiety level. If this theory is correct, a person given information and preparation for a threatening event

can use their cognitive processes to decrease the psychological responses associated with certain procedures (Moline, 2000; Mott, 1999).

In an early study by Johnson (1973), subjects were placed into three groups and were then assigned to receive sensory information, procedural information, or no information about tourniquet application to their arm. Subjects who had received accurate sensation descriptions of the procedure showed less intense emotional responses than the other groups at the time of the procedure. In more recent studies, the use of both sensory and procedural information has been found to help patients prepare for procedures and increase their coping abilities (Anderson, 1987; Garvin et al., 1992; Mott, 1999).

In studies that looked at preparing patients for cardiac catheterization, patients that were given various types of preparatory information regarding their procedure such as sensory-procedural information, modeling, cognitive-behavioral skills, or a combination were less anxious than those patients that did not receive any information (Anderson & Masur, 1989; Cason, Russell, & Fincher, 1992; Mott, 1999; Peterson, 1991). No consensus was reached among the researchers as to which method was more effective, however, it was noted that patients given any preparatory information had more positive outcomes than those patients that received no information. Therefore, in order to decrease anxiety and facilitate a more positive outcome, patients should be informed of the sensations that they may experience during removal of EPWs.

Patient Procedural Experiences

Preparatory information provided to the patient prior to removal of EPWs should include describing the sensations the patient will experience during EPWs removal. However, only one study was found that vaguely addressed this experience. Carroll et al.,

(1998) asked 145 postoperative cardiac surgery patients to describe their pain perceptions during EPWs removal. A verbal rating scale from 0 to 10 was used to rate pain immediately after the wires were removed. A report of 0 meant no pain was perceived during the procedure, while a rating of 10 equaled the worst pain possible. In addition, the patients were asked to describe any other sensations during the procedure. The mean rating of pain intensity on the verbal pain scale was 2.39 (SD = 2.77), however, 6% of the patients verbalized a score of 8 or higher on the pain scale. Descriptors to describe sensations during EPWs removal were self-reported. The responses ranged from tingling to rippling, but the frequency of these responses or the range of descriptors was not provided. No other literature was found that investigated the pain or sensation around EPWs removal. However, the most closely related procedure to EPWs removal with similar sensations maybe those experienced during chest tube removal.

Chest tubes are inserted in the patient during cardiac surgery to prevent accumulation of blood, fluid, and air in the mediastinal or pleural spaces following cardiac surgery. These tubes are generally removed 24-48 hours postoperatively (Calhoun-Thomson, Wells, & Maxwell, 1997). The technique to remove chest tubes, as with removal of EPWs requires a continuous firm pulling of the chest tube without meeting severe resistance until the chest tubes are completely removed (Calhoun-Thomson et al., 1997; Friesmith-Robinson, 1993; Gross, 1993).

A few studies describing patients' experiences during chest tube removal are reported in the literature. Puntillo (1994) studied the pain experiences of intensive care patients during endotracheal suctioning and chest tube removal. It was found that chest tube removal was perceived to be more painful than endotracheal suctioning. The

descriptors used to describe the experience of chest tube removal included; fearful, tender, sharp, and heavy. Other authors have also reported similar findings with chest tube removal being described as painful, burning, pulling, and pressure. Interestingly, contributing factors that led to an increase in the pain intensity and response during chest tube removal were inclusion of these groups; females, the younger population, and the use of internal mammary arteries for grafting (Gift, Spearing Bolgiano, & Cunningham, 1991; Meehan, McRae, Rourke, Eisenring, & Imperial, 1995).

As there is evidence to support that chest tube removal does cause varying degrees of pain and sensations, it has been suggested that distress related to chest tubes being removed may be diminished if preparatory information such as pain experienced during the procedure are provided to the patient prior to the procedure (Kinney, Kirchhoff, & Puntillo, 1995; Puntillo, 1994). This suggestion is supported by literature surrounding preparatory information published on various other invasive procedures as previously discussed.

In summary, the pain and sensations experienced by CABG surgery patients having EPWs removed has not been well studied. However, results from chest tube removal suggest that cardiac surgery patients do experience pain with varying sensations during this similar procedure. The literature on preparatory information supports the idea that patient outcomes are more positive and the patient experiences less anxiety when sensory information is provided to patients prior to an invasive procedure. Therefore, further research is warranted to identify the pain and sensations experienced during EPWs removal for CABG surgery patients. As the average age of our population continues to increase, heart disease will continue to be a disease that is on the rise. As

more people require surgical intervention for heart disease, the insertion of EPWs during cardiac surgery will continue to be common practice. Therefore, the investigation of the pain and sensations perceived during EPWs removal needs to be explored to provide appropriate nursing care for CABG patients.

Chapter Three

Method

The purpose of this study was to determine the quality and intensity of pain and other sensations experienced during the procedure of epicardial pacing wire (EPWs) removal in coronary artery bypass graft (CABG) surgery patients. Also, the anxiety level experienced during this procedure was documented as well as other factors relevant to the pain experience such as age, gender, postoperative day, previous cardiac surgery, and length of time since last analgesic.

Design

A descriptive design was used to assess the quality and intensity of pain and sensations experienced by CABG patients who underwent EPWs removal at the University of Alberta Hospital (UAH). The assessment was completed with each patient immediately following the removal of the EPWs. Also, factors identified to influence the experience (age, gender, postoperative day, previous cardiac surgery and/or EPWs removal, and analgesia) were collected for each patient.

Sample and Setting

The study was conducted at the University of Alberta Hospital in the Division of Cardiothoracic Surgery. The sample was a convenience sample of 100 postoperative CABG patients. There are approximately 40-50 CABG surgeries performed monthly. Data collection occurred from September 2002 to January 2003. Patients who met the inclusion criteria for the study were asked to participate. The inclusion criteria included patients that had undergone CABG surgery (no combined cardiac surgery was included such as valvular surgery and CABG); had intact atrial and ventricular EPWs; met

standard requirements for EPWs removal (Appendix A); were 18 years of age or older; were alert and oriented; and were able to write, read, and speak English.

Data Collection Protocol

A Nurse Practitioner in Cardiac Surgery approached those patients that met the inclusion criteria prior to EPWs removal on the Cardiothoracic Surgical Unit. Each morning, the researcher contacted the Nurse Practitioner to determine those eligible patients scheduled for EPWs removal. A release form was obtained by the Nurse Practitioner to allow the researcher to approach the patient (Appendix B). The researcher then approached those patients interested in the study. A verbal explanation of the study protocol was given to the patient. In addition, the patient received the information sheet (Appendix C) outlining the study protocol. Once the patient agreed to participate in the study, an informed consent was obtained (Appendix D). Demographic and other relevant data was also recorded on the data collection sheet (Appendix E). The McGill Pain Questionnaire - Short Form (MPQ-SF) (Appendix F), pain visual analogue scale (VAS-P) (Appendix G), and anxiety visual analogue scale (VAS-A) (Appendix H) were then explained to the patient. The MPQ-SF was printed in size 14 font to improve visualization of the pain tool for patients. Just prior to the EPWs removal by the Nurse Practitioner, the patient was asked to rate their anxiety level on the VAS-A. The EPWs were then removed according to the standard Cardiothoracic Surgery procedure (Appendix A). Following the EPWs removal, the patient was given the VAS-P to rate the level of pain experienced during the procedure. Next, the researcher read the MPQ-SF pain terms to the patient to identify and rate the applicable descriptors. Finally, the patient

was asked to describe the quality and intensity of the sensations experienced during the EPWs removal (Appendix I).

Instruments

Several pain assessment instruments have been developed over the years. However, there were only a few pain instruments measuring pain that were quantifiable, reliable, and valid (Flaherty, 1996). These tools aided the researchers in assessing and managing postoperative pain. The most common measurement tools used in adult medical and surgical settings included the visual analogue scale (VAS), the McGill Pain Questionnaire (MPQ), and the McGill Pain Questionnaire Short-Form (MPQ-SF) (Flaherty, 1996).

The VAS-P used consisted of a continuous vertical 100 millimeter (mm) line with anchors at each end signifying extremes of pain. The continuous line represented the pain intensity. One end represented "no pain" while the opposite end was "worst pain". A plastic ruler was used that had a straight 100-mm vertical line with a plastic cursor attached to the side of the ruler that freely slid up or down when manually manipulated by the subject. The subject was asked to indicate by sliding the cursor, the level of pain experienced at the time of assessment. The researcher then measured the mark from the 0-mm point up to the mark indicated by the subject (Carr, 1990; Carr & Thomas, 1997; Flaherty, 1996; Hancock, 1996; Jensen, Karoly, & Braver, 1986; Kitson, 1994; Klinger & Spaulding, 1998; Melzack, 1987; Melzack & Katz, 1992).

Advantages of using the VAS have been identified in terms of the simple design, ease of administration and avoidance of categorizing pain for the subjects. Also, the VAS provides an overall descriptor of pain intensity at the time of assessment (Flaherty, 1996;

Melzack & Katz, 1992). Studies that researched the pain experienced by CABG patients used the VAS as a tool without difficulty (Puntillo & Weiss, 1994; Valdix & Puntillo, 1995). The VAS has been demonstrated to be a valid and reliable measurement tool (Jensen et al., 1986). Numerical rating scales and the VAS have a correlation of r = .82 to .94 (Kuperberg & Grubbs, 1997; Puntillo & Weiss, 1994).

In addition to using the VAS-P for scoring pain, the VAS-A was also used to assess a patient's anxiety level. The bottom of the 100-mm ruler was labeled "no anxiety", while the top was labeled "worst anxiety". The subject indicated with the sliding cursor, the level of fear, anxiety or worry associated with the procedure. The researcher then measured the distance from the bottom of the scale in millimeters. VAS anxiety scores have been positively correlated (r =. 84) with scores obtained from the State-Trait Anxiety Inventory (Volgelsang, 1988).

Reported disadvantages to using the VAS have included, people having had difficulty with equating pain intensity to a straight line. Severe visual impairment and researcher error in measuring the patient's response may have also altered the effectiveness of the tool (Flaherty, 1996; Kitson, 1994). The VAS is a unidimensional tool and only measures one dimension of pain intensity. Therefore, there is difficulty in determining if the subject's score was a result of physical pain, emotional pain, anxiety or other factors (Kitson, 1994; Melzack & Katz, 1992). In order to have a more in depth understanding into the dimensions of pain, a more comprehensive tool was needed.

The MPQ is a comprehensive pain assessment tool that had been widely used to measure multiple dimensions of pain (Flaherty, 1996; Melzack, 1975; Melzack, 1987; Melzack & Katz, 1992; Puntillo & Weiss, 1994; Valdix & Puntillo, 1995). It provides

data on sensory, affective and evaluative dimensions of the pain experience (Melzack, 1987). The sensory and affective dimensions of the MPQ and MPQ-SF have strong correlations of $r = .65$ to .93 (Melzack, 1987). There are 20 sets of word descriptors that make up the MPQ. Each word is assigned a ranking that contributes to the overall pain score. The MPQ is a comprehensive tool that obtains data on the multidimensionality of pain (Melzack, 1975). The criticism of the MPQ is, that because it is so comprehensive, it could take up to 30 minutes to complete (Flaherty, 1996; Kitson, 1994; Melzack, 1987; Melzack & Katz, 1992). This is not feasible for the acutely ill patient. To assist in a more effective collection of multidimensional pain data, Melzack (1987) developed a short form, the MPQ-SF.

The MPQ-SF takes approximately 5 to 10 minutes to complete which is more realistic in an acute setting (Flaherty, 1996; Melzack, 1987; Puntillo & Weiss, 1994; Valdix & Puntillo, 1994). Fifteen word descriptors were chosen from the MPQ that measure sensory and affective pain dimensions to be used as descriptors of pain in the shorter pain tool. Eleven sensory and four affective terms, as well as present pain intensity (PPI) are represented. The researcher marked the appropriate rank for each descriptor identified by the subject. Only one mark was given per descriptor. Next, the subject told the researcher the appropriate descriptors for present pain intensity at the time of assessment. If the descriptor was not applicable, a score of zero was given (Melzack, 1975, Melzack & Katz, 1992). The PPI, and sensory and affective dimensions of the MPQ-SF have correlations of $r = .29$ and $r = .40$ to .42, respectively (Graham, Bond, Gerkovich, & Cook, 1980; Melzack, 1975). A VAS is also included in the MPQ-

SF. The MPQ-SF total scores and the VAS have a reported correlation of $r = .55$ to .86 (Melzack, 1987).

The MPQ-SF highly correlates with the MPQ in scoring pain. The MPQ-SF does not provide the same amount of information as the MPQ because there are fewer affective and sensory word descriptors. However, the MPQ-SF has been found to be sensitive in reporting the dimensions of pain that include sensory, affective, and overall pain intensity of subjects. The short form of the standard MPQ is the better tool used when lengthier assessments with subjects are restricted or not feasible (Melzack, 1987).

Thus, for this study, the MPQ-SF and a vertical VAS were used to assess the pain experience and anxiety level. The use of the MPQ-SF was most appropriate as the EPWs removal procedure did not take more than a few minutes to complete. The vertical placement of the VAS was used due to the ease of use in the postoperative period and in older adults (Flaherty, 1996; Klinger & Spaulding, 1998).

Data Analysis

Descriptive statistics involving frequency distributions and central tendency were used to describe the subject's demographic characteristics, MPQ-SF scores (sensory, affective, combined scores, and PPI), sensations reported, VAS-P scores, and VAS-A scores. To determine the relationship between various factors that may have influenced pain intensity, Chi-square analysis was used for categorical data; Pearson's r was used for analysis of relationships between continuous data, while Spearman's rho or *t* test was used for analysis of relationships between continuous and categorical variables. Statistical significance was set at $p \leq .05$.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Board, Capital Health. A letter of support was obtained from the Patient Care Director of Cardiac Sciences and the Director of Cardiac Sciences. The researcher provided a verbal and written explanation of the purpose of the study, including risks and benefits (Appendix C). An explanation was provided that indicated that the pain assessment tool would not alter the patient's recovery, and that the assessment would take only approximately 10 minutes. Information was provided regarding the patient's right to withdraw from the study at anytime without consequences to the care of the patient. An informed consent (Appendix D) was obtained prior to the EPWs being removed. To maintain patient confidentiality, a code number was given to each subject therefore eliminating the use of names. All raw data collected during the study were secured in a locked cabinet.

Chapter Four

Presentation of Findings

The purpose of this descriptive study was to determine the quality and intensity of pain and other sensations experienced during the removal of epicardial pacing wires (EPWs) in coronary artery bypass graft (CABG) patients at the University of Alberta Hospital. Also, the anxiety level experienced during this procedure was documented, as well as other factors relevant to the pain experience such as age, gender, postoperative day, previous cardiac surgery, and length of time since last analgesic. Descriptive statistics for patients' demographic characteristics, VAS-A scores, MPQ-SF scores (sensory, affective, combined scores, and PPI), VAS-P scores and sensations are reported. Chi-square analysis was used to analyze variables having categorical data; Pearson's r was used for analysis of relationships between continuous variables; Spearman's rho or *t* test was used for analysis of relationships between categorical and continuous variables. Statistical significance was set at $p \leq .05$.

Description of the Subjects

Between September 2002 and January 2003, a total of 137 patients met the inclusion criteria for the study. One hundred and eleven of these patients consented to participate in the study; however, 11 patients were not enrolled in the study as the physician or nurse removed the EPWs prior to the arrival of the researcher, 21 were missed due to researcher unavailability, and 5 refused to be in the study. Four of the 5 patients that refused to participate stated they were too exhausted, and 1 patient did not enroll in the study because he did not see any benefit to him. The final sample ($n = 100$) consisted of 85 males and 15 females, ranging in age from 41 to 89 years ($Mdn = 63.50$,

$M = 63.61$, $SD = 9.95$) (Table 1). Five subjects (5%) had previous cardiac surgery and were also the same subjects that had previously experienced removal of EPWs. The EPWs were removed from postoperative day 3 to 16 ($Mdn = 4.00$, $M = 5.28$, $SD = 2.69$). Fifty-three subjects (53%) received analgesic within 4 hours of EPWs removal (Table 1).

Table 1

Sample Characteristics ($n = 100$)

Characteristics	*Mode*	*Mdn*	*M*	*SD*	*Range*
Age (years)	63	63.50	63.61	9.95	41 - 89
Postoperative Day of EPWs Removal	4	4.00	5.28	2.69	3 - 16
VAS-A (mm)	50	40.00	40.02	27.02	0 -100
	Frequency			*Percent*	
Male	85			85	
Female	15			15	
Previous Cardiac Surgery	5			5	
Previous EPWs Removal	5			5	
Analgesia Given ≤ 4 hours Before EPWs Removal	53			53	

When subjects were asked to compare EPWs removal to the experience of chest tube removal, 8% reported EPWs removal as more painful, 67% reported EPWs removal to be less painful, 13% stated that the experiences were similar, while 12% could not remember the chest tube removal procedure (Figure 1).

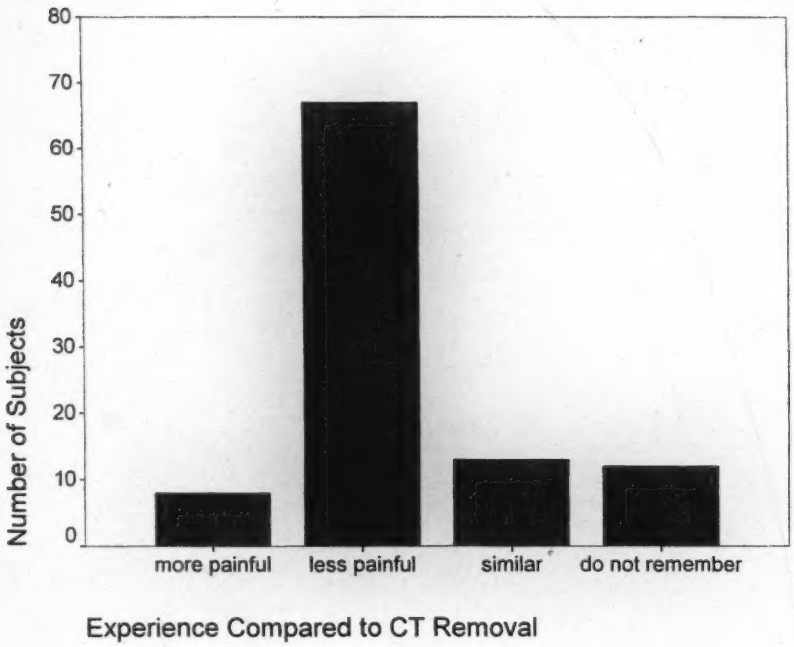

Figure 1. Epicardial Pacing Wire Removal Experience Compared to Chest Tube Removal.

Using the VAS-A, subjects were asked to rate their anxiety level prior to EPWs removal, 0 mm indicating no anxiety to 100 mm indicating the worst anxiety ever experienced. Subjects reported moderate levels of anxiety about the upcoming EPWs removal procedure. The VAS-A mean was 40.02 $\pm$ 27.02 with a mode of 50 mm for 11% of subjects (Table 1).

Intensity of Pain

The 11 sensory descriptors of the MPQ-SF have a score ranging from 0 to 3; 0 indicated no pain and 3 indicated severe pain. A maximum score of 33 could be obtained. The subjects reported low MPQ-SF sensory pain scores, with a range of 0 to 13

(*Mdn* = 3.00, *M* = 3.88, *SD* = 2.72). Four affective descriptors of the MPQ-SF also have the same scoring range as the sensory descriptors, thus allowing for a maximum score of 12. Subjects reported MPQ-SF affective pain scores ranging from 0 to 9 (*Mdn* = 0, *M* = .70, *SD* = 1.34). The maximum combined pain score on the MPQ-SF that could be achieved was 45. The combined MPQ-SF pain score for the subjects was low and ranged from 0 to 21 (*Mdn* = 4, *M* = 4.56, *SD* = 3.62) (Table 2).

Table 2

Reported Pain Intensity

Measures	*Mode*	*Mdn*	*M*	*SD*	*Range*
MPQ – SF Sensory score (max score = 33)	2	3	3.88	2.72	0 - 13
MPQ – SF Affective score (max score = 12)	0	0	.70	1.34	0 - 9
MPQ – SF Combined score (max score = 45)	2	4	4.56	3.62	0 - 21
VAS – P (mm) (max = 100 mm)	35	35	35.08	24.22	0 - 100
PPI (scoring 0-5)	1	1	1.64	.96	0 - 5

Also included in the MPQ-SF is the present pain intensity (PPI). Subjects were asked to rate the intensity of their pain according to the following descriptors: 0 (none), 1 (mild), 2 (discomforting), 3 (distressing), 4 (horrible), 5 (excruciating). Scores ranged from 0 to 5 (*Mdn* = 1, *M* = 1.64, *SD* = .96). Five subjects reported having no pain, 47 reported having mild pain, 33 reported discomforting pain, 11 reported distressing pain, 2 had horrible pain, and 2 had excruciating pain (Figure 2).

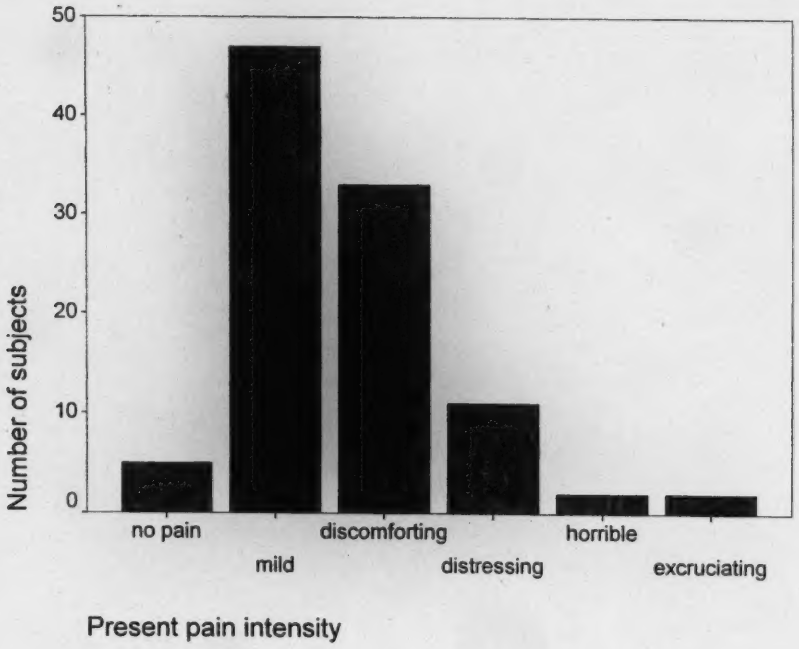

Figure 2. Reported Present Pain Intensity Scores for Epicardial Pacing Wire Removal.

Using the VAS-P, subjects were asked to rate their pain during EPWs removal. The VAS-P scores could range from 0 mm (no pain) to 100 mm (worst pain ever experienced). Subjects reported mild to moderate levels of pain during the EPWs removal procedure. The VAS-P mean was 35.08 $\pm$ 24.22, with a mode of 35 mm for 11% of subjects (Table 2).

Quality of Pain and Sensations

The quality of the pain and sensations were described using the sensory and affective descriptors of the MPQ-SF. The number of times each sensory and affective descriptor was used by the subjects is shown in Table 3.

Table 3

MCGill Pain Questionnaire – Short Form Descriptor Frequencies

Sensory Descriptor	None	Mild	Moderate	Severe	Percent Of Subjects Reporting Some Degree Of The Descriptor
Throbbing	97	3	0	0	3
Shooting	77	15	4	4	23
Stabbing	82	13	4	1	18
Sharp	53	35	9	3	47
Cramping	87	12	1	0	13
Gnawing	71	24	4	1	29
Hot-Burning	67	25	8	0	33
Aching	73	20	5	2	27
Heavy	81	14	3	2	19
Tender	29	42	25	4	71
Splitting	91	9	0	0	9
Affective Descriptor	**None**	**Mild**	**Moderate**	**Severe**	**Percent Of Subjects Reporting Some Degree Of The Descriptor**
Tiring-Exhausting	87	10	1	2	13
Sickening	91	5	3	1	9
Fearful	66	28	5	1	34
Punishing-Cruel	98	2	0	0	2

The most frequent sensory descriptor reported on the MPQ-SF, by 71% of the subjects, was tenderness. Following tenderness, the descriptor, sharp, was used by 47% of the subjects. The least identified sensory descriptor used was throbbing ($n = 3$) (Table 3). The most frequently reported affective descriptor on the MPQ-SF was the term fearful ($n = 34$), while the least reported affective descriptor was punishing-cruel ($n = 2$) (Table 3).

Sensations Experienced During Epicardial Pacing Wire Removal

The subjects were asked to describe sensations experienced during EPWs removal using their own words. They could use as many terms as they wanted to describe the sensations they experienced. Each sensation described by the subjects was then qualified as being mild, moderate, or severe in intensity (Table 4). The most common sensation reported was pulling ($n = 70$). Thirty-seven subjects reported mild pulling, 27 reported moderate pulling, and 6 reported severe pulling during EPWs removal. Burning ($n = 13$) and pinching ($n = 13$) were the second most common descriptors used (Table 4).

Table 4

Sensations Described By Subjects During Epicardial Pacing Wire Removal

Sensation	None	Mild	Moderate	Severe	Percent Of Subjects Reporting Some Degree Of The Descriptor
Pulling	30	37	27	6	70
Burning	87	6	7	0	13
Pinching	87	9	3	1	13
Scratching	90	3	4	3	10
Rumbling	94	3	3	0	6
Sliding	94	3	3	0	6
Stinging	94	3	3	0	6
Tugging	94	5	1	0	6
Tightening	98	2	0	0	2

Factors Influencing Pain and Sensations Experienced

Factors such as age, gender, number of postoperative days to removal of EPWs, previous cardiac surgery and EPWs removal, analgesic use, experience with chest tube removal, and level of anxiety were analyzed to determine the relationship to pain and sensations reported during EPWs removal.

Age was not significantly related to either MPQ-SF sensory, affective, or combined scores, as well as VAS-P scores (r = -.054, p = .592; r = .015, p = .885; r = -.044, p = .663; r = -.016, p = .874, respectively) (Table 5). Also, age was not significantly related to pain intensity as measured by the PPI score (r_s = -.026, p = .795) (Table 5). When grouping the age of subjects into under 65 years of age and those 65 years or older, no significant differences were found in MPQ-SF sensory, affective, or combined scores, and VAS-P scores (t = .310, p = .757; t = -3.58, p = .721; t = .158, p = .874; t = .023, p = .981, respectively). Also, no significant relationship to PPI scores existed even though 11% (n = 6) of subjects under 65 years of age reported PPI scores of 3 or higher, while 18% (n = 9) of subjects 65 years or older reported similar scores (χ^2 = 1.01, p = .313) (Table 6).

When gender was examined, there were no significant differences between males and females on MPQ-SF sensory, affective, or combined scores (t = .430, p = .668; t = .942, p = .349, t = .648, p = .518, respectively) (Table 6). VAS-P scores were also not significantly different for either gender (t = -.067, p = .947). Despite differences in male and female reported PPI scores, with 13% (n = 11) of males and 27% (n = 4) of females reporting PPI scores of 3 or higher, no significant difference was found between males and females (χ^2 = 1.88, p = .233) (Table 6).

The number of postoperative days to removal of EPWs was not significantly related to MPQ-SF sensory, affective, or combined scores, and VAS-P scores (r = -.074, p = .465; r = -.128, p = .205; r = -.100, p = .321; r = -.098, p = .333, respectively). Also, the number of postoperative days to EPWs removal was not significantly related to pain intensity as measured by PPI scores (r_s = -.046, p = .650) (Table 5). Subjects were divided into 2 groups; one group with EPWs removed 5 postoperative days or less, and the other group with EPWs removal over 5 postoperative days, no significant difference in MPQ-SF sensory or VAS-P scores were present (t = 1.76 p = .080; t = 1.89, p = .061, respectively) (Table 7). However, the number of postoperative days to EPWs removal was significantly different for MPQ-SF affective scores. Subjects having EPWs removed 5 postoperative days or less had a MPQ-SF affective mean score of .88, while subjects having EPWs removed greater than 5 postoperative days had a MPQ-SF affective mean score of .19 (t = 2.29, p = .024) (Table 7). Also, subjects having EPWs removed on postoperative day 5 or less had a MPQ-SF combined mean score of 5.01 while subjects having EPWs removed later than 5 postoperative days had a mean MPQ-SF combined score of 3.27 (t = 2.15, p = .034) (Table 7). No significant difference was present between the two groups in relation to reported PPI scores (χ^2 = .330, p = .753) (Table 7).

The 5 subjects that had previous cardiac surgery were also the same subjects that had experience with EPWs removal. Whether a subject had previous cardiac surgery and EPWs removal or not, had no significant relationship to MPQ-SF sensory, affective, or combined scores, and VAS-P scores (t = -1.07, p = .283; t = -1.20, p = .232; t = -1.24, p = .216; t = -.821, p = .414, respectively) (Table 7). Five subjects with previous cardiac surgery and EPWs removal experience had MPQ-SF affective mean scores of 0, and

lower MPQ-SF sensory and combined scores than the subjects without previous cardiac surgery and EPWs removal experience. Subjects having previous cardiac surgery and EPWs removal were no different than subjects without prior experience with cardiac surgery and EPWs removal on PPI scores ($\chi^2 = .929, p = 1.00$) (Table 7).

Whether a subject received analgesic within 4 hours prior to EPWs removal or not, did not have any relationship to MPQ-SF sensory, affective, or combined scores, and VAS-P scores ($t = .466, p = .642$; $t = -1.06, p = .290$; $t = .018, p = .986$; $t = -1.15$, $p = .251$, respectively) (Table 7). The 3 subjects that reported VAS-P scores of 100 mm were those that had not received analgesic within 4 hours prior to EPWs removal. No significant relationship was noted between the subjects that received analgesic within 4 hours prior to EPWs removal and those subjects that did not receive analgesic on PPI scores ($\chi^2 = .284, p = .594$) (Table 7). Thirteen percent ($n = 7$) of subjects that did receive analgesic within the 4 hours prior to EPWs removal had PPI scores of 3 or higher, which is similar to 12% ($n = 8$) of subjects that did not receive analgesic within 4 hours prior to EPWs removal that had PPI scores of 3 or higher.

Table 5

Correlation of Age and Postoperative Day to Epicardial Pacing Wire Removal to Pain Scores

Measures	Age	Postoperative Day to EPWs Removal
MPQ-SF Sensory	-.054 ($p = .592$)	-.074 ($p = .465$)
MPQ-SF Affective	.015 ($p = .885$)	-.128 ($p = .205$)
MPQ-SF Combined	-.044 ($p = .663$)	-.100 ($p = .321$)
VAS-P	-.016 ($p = .874$)	-.098 ($p = .333$)
PPI	$r_s = -.026$ ($p = .795$)	$r_s = -.046$ ($p = .650$)

Table 6

Correlation of Pain Scores with Age and Gender

Measures	Age (years)				Gender			
	< 65 (*M*)	≥ 65 (*M*)	*t*	*p*	Male (*M*)	Female (*M*)	*t*	*p*
MPQ-SF Sensory Scores (max = 33)	3.96	3.79	.310	.757	3.93	3.60	.430	.668
MPQ-SF Affective Scores (max = 12)	.65	.75	-.358	.721	.75	.40	.942	.349
MPQ-SF Combined Scores (max = 45)	4.62	4.50	.158	.874	4.66	4.00	.648	.518
VAS-P Scores (max = 100 mm)	35.13	35.02	.023	.981	35.01	35.47	-.067	.947
PPI Scores (max = 5)	*n* = 52	*n* = 48	χ^2	*p*	*n* = 85	*n* =15	χ^2	*p*
0-2 3-5	46 6	39 9	1.01	.313	74 11	11 4	1.88	.233

Table 7

Correlation of Pain Scores with Postoperative Day, Previous Cardiac Surgery and EPWs Removal, and Analgesic Use

Measures	Postoperative Day to EPWs Removal				Previous Cardiac Surgery and EPWs Removal				Analgesic Use			
	≤ 5 (*M*)	> 5 (*M*)	*t*	*p*	Yes (*M*)	No (*M*)	*t*	*p*	Yes (*M*)	No (*M*)	*t*	*p*
MPQ-SF Sensory Scores (max = 33)	4.16	3.08	1.76	.080	2.60	3.95	-1.07	.283	4.00	3.74	.466	.642
MPQ-SF Affective Scores (max = 12)	.88	.19	**2.29**	**.024***	.00	.74	-1.20	.232	.57	.85	-1.06	.290
MPQ-SF Combined Scores	5.01	3.27	**2.15**	**.034***	2.60	4.66	-1.24	.216	4.57	4.55	.018	.986
VAS-P Scores (max = 100 mm)	37.77	27.42	1.89	.061	26.40	35.54	-.821	.414	32.45	38.04	-1.15	.251
PPI Scores (max = 5)	*n* = 74	*n* = 26	χ^2	*p*	*n* = 5	*n* = 95	χ^2	*p*	*n* = 53	*n* = 47	χ^2	*p*
0-2 3-5	62 12	23 3	.330	.753	5 0	80 15	.929	1.00	46 7	39 8	.284	.594

Level of anxiety as measured by the VAS-A prior to EPWs removal was not significantly related to MPQ-SF sensory scores; however, VAS-A scores did correlate with MPQ-SF affective and combined scores ($r = .384$, $p = .000$; $r = .255$ $p = .010$, respectively). Thus, higher anxiety was associated with higher MPQ-SF affective and combined scores. Anxiety did not have a significant relationship to VAS-P or PPI scores (Table 8).

Table 8

Correlation of Pain to Anxiety Level Prior to Epicardial Pacing Wire Removal

Measures	*r*	*p*
MPQ-SF Sensory	.148	.142
MPQ-SF Affective	**.384**	**.000**
MPQ-SF Combined	**.255**	**.010**
VAS-P	.089	.378
	r_s	*p*
PPI	.182	.070

Congruence Among Pain Measurements

Concordance among the pain measures was examined. Within the MPQ-SF, sensory scores and affective scores had a moderate relationship ($r = .514$, $p = .000$) (Table 9). Furthermore, MPQ-SF combined scores correlated with MPQ-SF sensory scores ($r = .946$, $p = .000$) and MPQ-SF affective scores ($r = .759$, $p = .000$). Reported reliability coefficients for the MPQ-SF sensory and affective dimensions varied between

r = .75 to .87 (Puntillo, 1994; Puntillo & Weiss, 1994). In addition, PPI scores correlated with MPQ-SF sensory, affective, and combined scores (r_s = .667, p = .000; r_s = .424, p = .000; r_s = .701, p = .000, respectively). The PPI and sensory and affective dimensions of the MPQ-SF have reported correlations of r = .29 and r = .40 to .42 respectively (Graham, Bond, Gerkovich, & Cook, 1980; Melzack, 1975). The MPQ-SF combined score and PPI have correlations of r = .32 to .70 (Melzack, 1987). Also, PPI scores were significantly related to VAS-P scores (r_s = .792, p = .000). VAS-P scores correlated with MPQ-SF sensory, affective, and combined scores (r = .716, p = .000; r = .449, p = .000; r = .705, p = .000, respectively) (Table 9). Similarly, Melzack (1987), reported a correlation of r = .55 to .86 for MPQ-SF combined scores and the VAS-P.

Table 9

Concordance of Pain Measures

Measures	MPQ-SF Sensory	MPQ-SF Affective	MPQ-SF Combined	VAS-P	PPI
MPQ-SF Sensory		.514*	.946*	.716*	.667*
MPQ-SF Affective	.514*		.759*	.449*	.424*
MPQ-SF Combined	.946*	.759*		.705*	.701*
VAS-P	.716*	.449*	.705*		.792*
PPI	.667*	.424*	.701*	.792*	

*significance at $p \leq .05$.

Chapter Five

Discussion of Findings

In this study, a descriptive design was conducted with adult coronary artery bypass graft (CABG) patients requiring epicardial pacing wire (EPWs) removal. The purpose of this study was to determine the quality and intensity of pain and other sensations experienced during the procedure of EPWs removal. Also, the anxiety level experienced during this procedure was documented as well as other factors relevant to the pain experience such as age, gender, postoperative day, previous cardiac surgery and EPWs removal, and length of time since last analgesic. Descriptive statistics were used to describe subjects' demographic characteristics, MPQ-SF scores (sensory, affective, combined scores, and PPI), sensations reported, VAS-P scores, and VAS-A scores. Analysis of relationships between various factors that may have influenced pain intensity included Chi-square for categorical data and Pearson's r for relationships between continuous data. In addition, Spearman's rho or *t* test was used for analysis of relationships between categorical and continuous variables.

Pain and Sensations Experienced During EPWs Removal

The use of EPWs in cardiac surgery is standard practice. Historically, physicians have been responsible for removing the EPWs because of the potential complications that can occur from EPWs removal. However, the removal of EPWs is becoming an expanded role for nurses. As this procedure becomes a nursing function, nurses are expected to prepare patients and provide patient teaching about the procedure of EPWs removal (Wollan, 1995).

The demographic characteristics of this convenience sample were those typically found in the cardiac surgery population requiring CABG surgery. The 100 subjects that were enrolled consisted of 85 male subjects and 15 female subjects. The mean age of subjects was 63.51 $\pm$ 9.95. Routinely EPWs are removed on the 4th or 5th postoperative day following cardiac surgery (Johnson et al., 1993; Lynn-McHale et al., 1991; Manion, 1993; Wollan, 1995); similarly, in this study, the mean number of postoperative days to EPWs removal was 5.28 $\pm$ 2.69. Of the 100 subjects, 5 had previous cardiac surgery and EPWs removal experience. Fifty-three percent were given analgesic within 4 hours of EPWs removal. No change in nursing practice occurred during this study as participants had their EPWs removed by a Nurse Practitioner who followed unit policy and procedure for EPWs removal.

Patients that are educated about their disease and/or surgical experiences are less likely to be anxious and are more willing to be compliant with the medical regimes necessary in their care (Fortner, 1998). Prior to education about the EPWs removal procedure, the anxiety level of subjects was moderate with 11% of subjects scoring a measurement of 50 mm on the VAS-A. Subjects reported low pain intensity as identified by low MPQ-SF sensory (M = 3.88) and affective pain (M = .70) scores. Overall, the combined MPQ-SF pain score (M = 4.56) and PPI scores (M = 1.64) were low. VAS- P scores were found to be moderate (M = 35.08), which was a similar finding in the only study located to date that researched pain and sensations that may be experienced during EPWs removal (Carroll et al., 1998). Seventy-one subjects described the quality of the pain experienced as tender, followed by the descriptor sharp (n = 47). The least identified sensory descriptor used was throbbing (n = 3). The most frequently reported affective

descriptor on the MPQ-SF was the term fearful (n = 34), while the least reported affective descriptor was punishing-cruel (n = 2). Carroll et al., (1998) reported that sensations during EPWs removal included tingling and ripping, which were not sensations reported by any of the subjects in this study. Instead, the most common sensation described by the subjects during EPWs removal was pulling (n = 70), with 37 subjects reporting mild pulling, 27 reporting moderate pulling, and 6 reporting severe pulling during EPWs removal. Interestingly, the patients in this study similarly identified only 9 descriptors to describe the sensations they experienced during EPWs removal. In comparison to other procedural postoperative cardiac surgical pain, chest tube removal is a similar procedure to EPWs removal. A conclusion as to which procedure is more painful cannot be made as no quantification of pain intensity has been reported for chest tube removal. However, chest tube removal sensory descriptors reported have included burning, pulling, fearful, tender, and sharp (Gift, Spearing Bolgiano, & Cunningham, 1991; Meehan, McRae, Rourke, Eisenring, & Imperial, 1995), which are similar descriptors that subjects in this study used to describe EPWs removal.

The pain and sensations experienced by this cohort varied as reported by the MPQ-SF and PPI scores, as well as the VAS-A and VAS-P scores. Each individual identified painful experiences differently. Painful experiences are not only due to physical injury, but also are influenced by ones' culture, learned behavior, pain tolerance, and previous pain experienced (Melzack & Katz, 1992).

Factors Associated With Pain During EPWs Removal

Age, gender, anxiety, and analgesic administration have been identified as factors affecting postoperative pain management (Carroll et al., 1998; Ferguson et al., 1997;

Puntillo & Weiss, 1994). These factors and others, such as number of postoperative days to removal of EPWs, and previous cardiac surgery and EPWs removal were analyzed to determine the relationship to pain and sensations reported during EPWs removal. In this study, none of these factors were significantly related to the pain experienced during EPWs removal, with the exception of the number of postoperative days to EPWs removal. The subjects that had EPWs removed in 5 postoperative days or less had significantly higher MPQ-SF affective and combined scores. It is difficult to conclude why this would be the case, but possibly the recentness of the surgery, and the number of procedures that are performed to the patient within the first 4-5 postoperative days may elicit more fear of upcoming procedures. However, of note was that 11% ($n = 6$) of subjects under 65 years of age reported PPI scores of 3 or higher, while 18% ($n = 9$) of subjects 65 years or older reported similar scores; only 13% ($n = 11$) of males reported PPI scores or 3 or higher, while 27% ($n = 4$) of females reported PPI scores of 3 or higher. Interestingly, the 5 subjects with previous cardiac surgery and EPWs removal experience had MPQ-SF affective mean scores of 0, and lower MPQ-SF sensory and combined scores than the subjects without previous cardiac surgery and EPWs removal experience suggesting that previous experience with EPWs removal may influence subject response. Patients with sensory information about a procedure are not confronted with unexpected sensations (McHugh, Christman, & Johnson, 1982). However, this is difficult to confirm as there were only 5 subjects that had previous experience with cardiac surgery and EPWs removal.

Receiving analgesic within 4 hours prior to EPWs removal was not significantly related to MPQ-SF, VAS-P or PPI scores. However, the 3 subjects that reported VAS-P

scores of 100 mm were those that had not received analgesic within 4 hours prior to EPWs removal. Also, the level of anxiety prior to EPWs removal was not significantly related to MPQ-SF sensory scores, VAS-P or PPI scores; however, higher anxiety levels were significantly related to higher MPQ-SF affective and combined scores. It has been supported by the literature that preparatory information, which accurately describes sensations experienced during threatening procedures, reduces the discrepancies between expected and experienced sensations and thus, reduces anxiety (Garvin, Huston, & Baker, 1992; Hartfield, Cason, & Cason, 1982).

Limitations of the Study

The convenience sample of CABG surgical patients limits the generalization of findings to only this cardiac surgery cohort. Other limitations to the study were that some subjects were actually roommates. Therefore, when the first subject was studied, the second subject was able to hear the responses provided by the first subject; this could have affected the responses. Also, five different surgeons performed the CABG procedures. The way in which the EPWs were secured to the epicardium and the exact placement of the EPWs was not the same (e.g. one subject had spring loaded EPWs); therefore, the force of pulling needed to remove the EPWs differed. This particular subject reported no pain and did not experience any sensations during EPWS removal. Two subjects had EPWs that required the use of forceps to separate the wires in order to get a firmer grip on the wire to facilitate removal of the EPWs. These two subjects reported moderate to severe pain. Occasionally, subjects found it very difficult to describe in their own words the sensations felt during EPWs removal. When asked to compare the pain experienced during EPWs removal to that of chest tube removal,

12 subjects could not remember having their chest tubes removed. Other variables not controlled that may have also influenced the findings, were events occurring to the patient prior to EPWs removal (i.e. having had another procedure performed), or the Nurse Practitioner technique.

Conclusions

As more nurses are expected to remove EPWs following CABG surgery, it is important for the nurse to be able to inform the cardiac patient of the possible pain or sensations that may be experienced during EPWs removal. Having this knowledge will enable the nurse to prepare the patient adequately and offer support and reassurance. Patients that receive preparatory information have more positive outcomes than those patients that receive no information (Anderson& Masur, 1989; Cason, Russell, & Fincher, 1992; Mott, 1999; Peterson, 1991).

From the findings of this study, most CABG patients reported having a mild degree of pain and experienced the sensation of pulling during EPWs removal. Only those patients having EPWs removal on postoperative day 5 or less reported significantly higher MPQ-SF affective and combined scores. However, patients who did not receive analgesic within 4 hours of EPWs removal tended to have higher VAS-P scores, therefore, it may be beneficial to offer analgesics to patients prior to EPWs removal. Also, CABG postoperative patients were moderately anxious about the upcoming EPWs removal procedure. The nurse can incorporate the intensity and quality of pain generally experienced with EPWs removal into patient preparation for this postoperative cardiac procedure to alleviate anxiety. Supporting and educating CABG patients about the pain

and sensations experienced during EPWs removal should become an integral part of nursing care.

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Appendix A

UAH Cardiothoracic Surgery Epicardial Pacing Wire Removal Policy and Procedure

TITLE: Epicardial Pacemaker Wires – Removal of (EPWR)

ISSUE DATE: July 2001 **LEVEL:** 3G3/4 3A2

A STRN may remove epicardial pacemaker wires (EPWR) under the following condition:

1. Full-time or Part-time employee of 3G3/3G4 or 3A2.
2. Successful completion of the certification program "Removal of Epicardial Pacemaker Wires" with pass mark of 80 % on written exam.
3. Successful recertification annually.
4. Upon written or verbal physician order, the STRN will evaluate the following appropriate removal criteria:
   a) Cardiac rhythm stability within the past 24 hours (notify physician if patient is in 2nd degree heart block, 3rd degree heart block, symptomatic bradycardia, rapid atrial dysrhythmias, asystole, premature ventricular contractions, ventricular tachycardia and ventricular fibrillation).
   b) Anticoagulant therapy: PT INR < 2 and/or PTT < 33. If PT INR 2 – 2.5 and/or PTT 33 – 55 discuss with MD prior to removal. When PT INR > 2.5 and/or PTT > 55 RN can not remove epicardial pacemaker wires.
   c) Specified discharge/transfer plan.
5. During and post removal of EPW the patient must remain supine for ½ hours.
6. Vital signs are to be performed and recorded q 30 minutes x 2 post epicardial pacemaker wire removal.
7. Patient is to remain in hospital a minimum of 4 hours post epicardial pacemaker wire removal.
8. Physician must be immediately available to respond to STAT call.

Tammy Dambeiger, RN, BScN Patient Care Manager-3g3/G4 Acting Patient Care Manager 3A2	Dr. A. Koshal Regional Program Clinical Director Cardiac Sciences	Dr. D. Mody Director of Heart and Lung Transplantation Program & C.S.I.C.U. 3A2

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TITLE:	Epicardial Pacemaker Wires - Removal of	NUMBER:
ISSUE DATE:	July 2000	Level: 3A2, 3G3/4

PURPOSE:

To remove epicardial pacemaker wires (EPW) once removal criteria have been met.

EQUIPMENT :

- non-sterile gloves
- sterile scissors
- Chlorhexidine swabs or stick
- 2 - 2 x 2 gauze
- tape

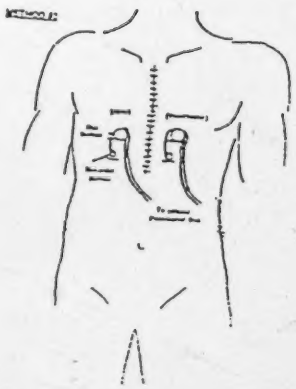
PROCEDURE:

1. Ensure written order by physician to remove EPW. Notify physician of rhythm disturbances or if patient is being anticoagulated prior to removal of EPW.
2. Gather equipment.
3. Perform and document vital signs (HR, BP, Temperature, RR) in addition to heart rhythm if patient is being monitored.
4. Wash hands and don gloves.
5. Explain procedure to patient. Inform patient that he/she will experience a tugging sensation during EPWR and must remain supine during and for ½ hr. following procedure. Also, that he/she should notify staff member of any discomfort.
6. Remove pacing wires from dressing. If temporary pacemaker generator is still attached, it must be in the OFF position and disconnected from the patient.
7. Cleanse EPW sites with Chlorhexidine swabs or sticks.

8. Methods of EPWR:

Method : Dr. Gelfand, Dr. Koshal, Dr. Mullen and Dr. Rebeyka

a) Locate knot of EPW.
b) Gently slide the EPW next to the knot, noting which side of the knot moves freely. One side will move more freely as it is loosely looped through the skin. The other side will be more resistant to movement, as it is attached to the epicardium.
c) Hold onto the knot and cut with sterile scissors on the side of the knot that moves more freely (skin side). Once you cut the side of the EPW it can be easily pulled out through the skin.
d) Continue to hold the knot as this end of the EPW is attached to the epicardium. Pull EPW with slow continuous motion using gentle traction and remove from chest. If strong resistance is met STOP procedure and notify physician.
e) Perform steps "a - d" for single or double atrial and ventricular EPW.
"single bipolar atrial and ventricular leads are utilized in the adult congenital cardiac surgery patients



9. Inspects tips of EPW for intactness. (Scant tissue fragments may be present). If tips are not intact, save wire and notify physician. Also, inspect EPW sites for suspected infection. If infection is suspected, obtain and send swab for culture and sensitivity.

10. Cover EPW insertion sites with 2 x 2 gauze and secure with tape.

11. Remove gloves and wash hands.

12. Document procedure in patient care record including time of removal and any complications. Write in kardex date of EPW removal and sign-off on Doctors order.

Appendix B

Release Form

Coronary Artery Bypass Graft Patients' Pain Perception during Epicardial Pacing Wire Removal

Principal Investigator: Sylvia Roschkov, RN, MN Student
University of Alberta Hospital - WMC 3G1.16
Edmonton, Alberta T6G 2B7

Thesis Supervisor: Louise Jensen, RN, PhD., Professor
Faculty of Nursing, University of Alberta
Edmonton, Alberta T6G 2G3

I _____ understand that a researcher will come speak to me about the epicardial pacing wire removal study. I am interested in having my name given to the researcher to approach me to give me more information about the study.

_____ _____

Patient's signature Nurse Practitioner's Signature

_____

Date

Appendix C

Patient Information Sheet

Coronary Artery Bypass Graft Patients' Pain Perception during Epicardial Pacing Wire Removal

Principal Investigator: Sylvia Roschkov, RN, MN Student
University of Alberta Hospital - WMC 3G1.16
Edmonton, Alberta T6G 2B7
Pager: 445-7412

Thesis Supervisor: Louise Jensen, RN, PhD., Professor
Faculty of Nursing, University of Alberta
Edmonton, Alberta T6G 2G3
Phone: 492-6795

Patients that have coronary artery bypass graft surgery routinely have temporary epicardial pacing wires (EPWs) inserted during the operation. Little is known about the pain or sensations that are felt during the removal of the EPWs.

The purpose of this study is to describe the pain and sensations felt during EPWs removal. By gaining an understanding of the pain and sensations felt during EPWs removal, patients can be better prepared.

If you choose to take part in this study, the researcher will get your written consent. As soon as your EPWs are removed, the researcher first will ask you to describe the sensations you felt. Then you will select, from a list of words, the word (or words), which best described your pain and sensations during EPWs removal. You will rate on a scale how severe your pain and anxiety were during the EPWs removal. This will take about 10 minutes to complete.

Your participation in the study will enable the researcher to describe the pain and sensations that are felt during EPWs removal to patients that will undergo the same procedure. There are no risks to being involved in this study.

Some of the information needed for the study, such as your age, gender, pain medication, and previous heart surgery will be collected from your hospital chart. All information will be kept confidential except when a professional code of ethics and/or legislation requires reporting.

Your name will not be used in this study, only a code number will appear on all data collected. The information from this study will be kept by the researcher for a period of 7 years in a locked cabinet then destroyed. The findings of the study may be published and/or presented at conferences. However, your name will not be given out at any time.

Participation in this study is voluntary. If you do take part in the study, you are free to withdraw at any time. You may also refuse to answer any questions. If you choose not to take part in the study, the quality of your care will not be affected. If you withdraw from the study, your information will be destroyed and not used in the study.

If at any time you have further questions about the study, please contact Sylvia Roschkov, RN, MN student at pager 445-7412. If you have any concerns about any aspect of this study, you may contact the Patients Concerns Office at the Capital Health Authority at 407-1040. This office has no affiliation with the study investigators.

_____	_____	_____
Patient's initials	Researcher's initials	Date

Appendix D

Consent to Participate

Part 1
Title of Project: Coronary Artery Bypass Graft Patients' Pain Perception during Epicardial Pacing Wire Removal

Principal Investigator: Sylvia Roschkov, RN, MN Student
University of Alberta Hospital - WMC 3G1.16
Edmonton, Alberta T6G 2B7

Thesis Supervisor: Louise Jensen, RN, PhD., Professor
Faculty of Nursing, University of Alberta
Edmonton, Alberta T6G 2G3

Part 2 (to be completed by the research subject):

Do you understand that you have been asked to be in a research study?	Yes No
Have you read and received a copy of the attached information sheet?	Yes No
Do you understand the benefits and risk involved in taking part in this research study?	Yes No
Have you had an opportunity to ask questions and discuss this study?	Yes No
Do you understand what your involvement in the study entails?	Yes No
Do you understand that you are free to refuse to participate or withdraw from the study at any time? You do not have to give a reason and it will not affect your care.	Yes No
Has the issue of confidentiality been explained to you? Do you understand who will have access to your records?	Yes No
Do you understand that your name will not be revealed in any reporting of the study results?	Yes No

This study was explained to me by: _____
I agree to take part in this study.

_____ _____ _____
Signature of Research Participant Printed Name Date

I believe that the person signing this form understands what is involved in the study and voluntarily agrees to participate.

_____ _____
Signature of Researcher Date

THE INFOMRATION SHEET MUST BE ATTACHED TO THIS CONSENT FROM AND A COPY GIVEN TO THE RESEARCH SUBJECT

Appendix E

Data Collection Sheet

Patient hospital # _____ Code # _____

Postoperative Day: _____

Age: _____ Gender: M F

Previous cardiac surgery: Yes No

Previous EPWR experience: Yes No

Analgesia < 4hours of EPWs removal: Yes No

Name of analgesia last received prior to EPWs removal: _____

Length of time (mins) since last analgesia dose given: _____

Dose of analgesia given: _____

MPQ-SF Scores:

Sensory: _____

Affective: _____

Total (sensory & affective): _____

PPI: _____

VAS-P Scores (mm): _____

VAS-A Scores (mm): _____

Experience compared to CT removal: More Painful Less Painful Similar

---

Appendix F

McGill Pain Questionnaire – Short Form (MPQ-SF)

Patient hospital # _____ Code # _____

	None	Mild	Moderate	Severe
throbbing	0) ____	1) ____	2) ____	3) ____
shooting	0) ____	1) ____	2) ____	3) ____
stabbing	0) ____	1) ____	2) ____	3) ____
sharp	0) ____	1) ____	2) ____	3) ____
cramping	0) ____	1) ____	2) ____	3) ____
gnawing	0) ____	1) ____	2) ____	3) ____
hot-burning	0) ____	1) ____	2) ____	3) ____
aching	0) ____	1) ____	2) ____	3) ____
heavy	0) ____	1) ____	2) ____	3) ____
tender	0) ____	1) ____	2) ____	3) ____
splitting	0) ____	1) ____	2) ____	3) ____
tiring-exhausting	0) ____	1) ____	2) ____	3) ____
sickening	0) ____	1) ____	2) ____	3) ____
fearful	0) ____	1) ____	2) ____	3) ____
punishing-cruel	0) ____	1) ____	2) ____	3) ____

Present Pain Intensity

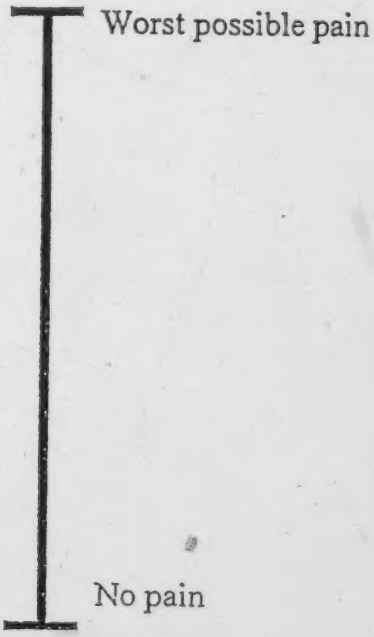
0	no pain	_____
1	mild	_____
2	discomforting	_____
3	distressing	_____
4	horrible	_____
5	excruciating	_____

(reprinted with permission from Melzack, R. 1999).

Appendix G

Visual Analogue Scale – Pain (VAS-P)

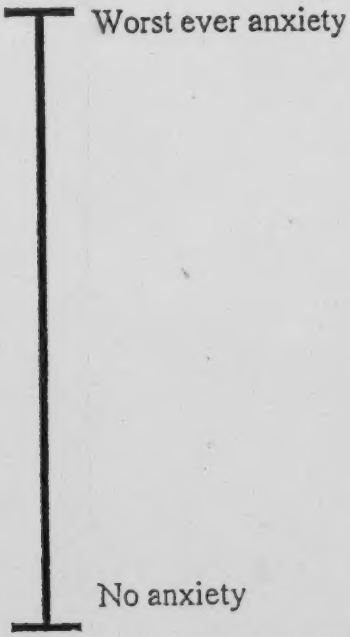
Patient hospital # _____ Code # _____



Appendix H

Visual Analogue Scale – Anxiety (VAS-A)

Patient hospital # _____ Code # _____



Appendix I

Sensations Perceived

Patient hospital # _____ Code # _____

1. Describe the sensations you experienced during EPWs removal.

   a) What did it feel like?

   b) What was the intensity? (Mild, Moderate, Severe)

Sensation described	Mild	Moderate	Severe
_____	1)_____	2)_____	3)_____
_____	1)_____	2)_____	3)_____
_____	1)_____	2)_____	3)_____
_____	1)_____	2)_____	3)_____
_____	1)_____	2)_____	3)_____
_____	1)_____	2)_____	3)_____

2. Was the experience of EPWs removal more painful, less painful, or similar to chest tube removal?

   More Painful Less Painful Similar